CHANGING PATTERN OF CARDIOVASCULAR RISK WITH DURATION OF DIABETES MELLITUS

Chundusu CM (FWACP): Department Of Medicine, College of Medical Sciences, University of Jos, PMB 2084, Jos, Plateau State, Nigeria.

Correspondence:
Dr Chundusu C M
Phone: +2348037032797,
Email calebchundusu@yahoo.com

ABSTRACT

Background*: Diabetes Mellitus is a common chronic endocrine disorder of insulin secretion or function resulting in the disturbances of carbohydrate, fat and protein metabolism characterised by hyperglycemia. Cardiovascular complications are the most important cause of morbidity and mortality.*

Objectives: *To assess the pattern of cardiovascular risk among diabetic patients enrolling for the first care at the specialist clinic, and also determined the effects of the duration of DM on cardiovascular risk.*

Method: *One hundred and fourteen asymptomatic people living with diabetes mellitus were evaluated considering time at first diagnosis of DM irrespective of the initial care given. Cardiovascular risk factors were compared in two groups based on the median year duration of DM. A further 6 sub-grouping was done to look at pattern of increase of the different CVD risk factors.*

Results: *duration of DM range from 1-30 years, median of 5 years and modal of 1 year. There was a difference in the means of all CVD risk factors when subjected were divided into two groups based on the median age. Further sub-groupings of duration of DM showed significant differences in LVM, uric acid and creatinine.*
Conclusions: cardiovascular risk no doubt increases as the duration of DM increases and more significantly on the heart and the kidney.

Key words*; diabetes duration, first specialist clinic visit, cardiovascular risk*

INTRODUCTION

Diabetes Mellitus (DM) is a common chronic endocrine disorder of insulin secretion or function resulting in the disturbances of carbohydrate, fats and protein metabolism characterised by hyperglycemia. Cardiovascular complications are the most important cause of morbidity and mortality expected to increase most in countries with the least developed public health care systems[1]. Epidemiological and clinical trial data have estimated that 60–70% of all patients with type 2 diabetes will die from CVD[2]. This is particularly challenging, as their CVD is more often asymptomatic. DM adds about 15 years in terms of cardiovascular risk compared to normal individuals[3]. People living with diabetes under the age of 40 years are not particularly at high cardiovascular risk, however with time their cardiovascular risk increase because they are expected to have lived longer with DM[4].

Duration of DM is a very important factor in the development of cardiovascular complications[5]. Clinical presentation in most cases is usually after development of a complication. For instance, overt nephropathy caused by glomerulosclerosis first appears 10-15years after the onset of insulin dependent DM (IDDM) and after 5-10years in patients with non-insulin dependent DM (NIDDM).[5,6] Duration of DM might give an idea of what complications is be present. Most patients present to the specialist clinic after having consulted several other treatment modalities ranging from self medication, faith based interventions, nearby chemists or laboratories.

This work ties to compare two groups of patients that presented to the specialist unit considering their duration of illness. The median value of duration of age was used as dividing point so as to get a proportionally equal no of subjects for analysis. The possibility of a changing pattern or progression

cardiovascular risk with respect to duration of disease should be of interest to any specialist.

Methods

This was a cross sectional study among adults 18years old or above, consecutively recruited while being evaluated on first specialist clinic visit at the medical out-patient clinic at the Jos University Teaching Hospital. All the patients consented and the study was approved by the Ethics Committee of the Jos University Teaching Hospital.

A questionnaire was used to obtain bio-data and relevant clinical history with durations and a general clinical examination was carried out on the subjects. Fasting plasma glucose, waist circumference and BMI were measured. Blood pressure (BP) was measured in the right arm with subjects in a seated and relaxed position using a mercury sphygmomanometer. The first and fifth phases of the Korotkoff sounds were used for the systolic and diastolic blood pressure respectively.

Laboratory analysis: Seven (7) mls of fasting venous blood sample was taken for serum electrolytes analysis. Serum lipids and uric acid were determined

Ultrasonography: The carotid intima-media thickness of the far wall of proximal 10mm of the two common carotid arteries were determined using the 8.0 MHz probe of real time B mode ultrasound imager (ALOKA SSD 4000 ultrasound system Japan). The average of four values (two from each side) was used for the study. A 3.5 MHz probe (ALOKA SSD 4000 ultrasound system Japan) was then used to obtain 2D guide M-mode left ventricular measurements through the left parasternal long axis view window for all subjects. Measurements were taken from leading edges. The Left ventricular mass was calculated using the Devereux formula.

Statistical analysis: Subjects were regrouped based on the median of duration of DM, those with duration of diabetes for 5year or less and those with duration of diabetes for 6years and above. Those that were less than 1 year were approximated to be 1 year for analysis to be done in years. Continuous variables were expressed as means ± standard deviation (SD). Analysis was done with both Epi-info 3.5.1 and student T test was done to compare means of the two groups. A further regrouping was done.

Results

A total data of 114 participants were analysed. Subjects were between the ages of 21 and 88 years. The total mean age was 55.29 ± 14 years.

The subjects were mostly already on anti-diabetic agent/drug Metformin (70%), sulfonylurea Glibenclamide (52%), implying that most subjects were type 2 diabetics. The thiaozolidinediones and glucosidase inhibitors and other relatively newer anti-diabetic drugs were prescribed to very few subjects. Hypertension was the most common co-morbidity (51%), and the most common anti-hypertensive drugs taken by diabetic-hypertensive were of the angiotensin receptor blockers (ARB) or angiotensin converting enzyme inhibitor(ACEI) (50%) group followed by Calcium channel blockers (30%). Diuretics were noted in 25% of subjects.

The duration of DM ranged from 1year to 30 years, with a mean of 6.99 ± 5.97 years and median of 5years. The 25th and 75th quartiles were 2 and 10 years respectively. About 18% of subjects were diagnosed as having DM within a year. A comparative group with duration of DM less than 5 years and 6 years and above is shown on table 1. Similarly echocardiography findings were compared as shown in table 2. Another regrouping is shown in table 3.

Table . CLINICAL CHARECTERISTICS OF DM PATIENT WITH DURATION OF DM LESS THAN 6 YEAR AND ABOVE 5 YEARS

			T value
Duration of DM	*≤5 years*	*>5 years*	
N %	59%	41%	
FEMALE SEX %	62%	60%	
HTN %	58%	60%	
AGE (mean ± SD	52 +11	60 +14	3.40
BMI (mean ± SD)	21.50 ± 12.31	25.95 ± 9.43	2.09
SBP (mean ± SD)	129.30 +19.65	136.50 +21.19	1.86
DBP (mean ± SD)	83.09 + 11.33	80.39 + 10.46	1.29
FBS (mean ± SD)	9.75 + 5.66	9.30 +4.45	0.56
TC (mean ± SD)	4.68 ± 1.16	5.12 ± 1.52	1.75
HDL (mean ± SD)	1.17 +0.41	1.26 +0.48	1.08
TC/HDL(mean± SD)	4.17 +1.15	4.34 +1.32	0.73
TG (mean ± SD)	1.44 +0.58	1.69 +0.99	1.70
CR (mean ± SD)	89.14 + 18.33	103.38 +52.31	2.06
UA (mean ± SD)	339.08 + 101.27	400.78 +95.24	3.28
UREA (mean ± SD)	4.54 + 2.01	6.13 + 3.49	3.25

Table . CLINICAL CHARACTERISTICS OF DM PATIENT WITH DURATION OF DM LESS THAN 6 YEARS AND ABOVE 5 YEARS

			T-value
Duration of DM	*≤5 years*	*>5 years*	
IVSD (mean ± SD)	10.92 +2.94	11.58 +3.19	1.14
IVSS (mean ± SD)	16.06 +3.13	16.53 +3.42	0.76
LVIDD (mean ± SD)	51.69 +7.08	53.24 +9.74	0.89
LVIDS (mean ± SD)	35.16 +7.45	43.88 +8.63	5.76
LVPWD (mean ± SD)	10.14 +1.57	10.17 +2.13	0.09
LVPWS (mean ± SD)	13.71 +2.42	14.24 +2.47	1.14
EDV (mean ± SD)	127.65 +37.37	138.63 + 55.35	1.27
ESV (mean ± SD)	53.73 +28.89	53.32 +32.05	0.07
EF (mean ± SD)	58.67 +14.15	60.67 +13.57	0.76
FS (mean ± SD)	31.81 +9.29	34.16 + 10.15	1.28
LVM (mean ± SD)	244.94 + 75.47	273.52 + 113.51	1.6

Table . RISK FACTORS IN DIFFERENT GROUPINGS OF DURATION OF DM

Duration of DM	<1yr	1-5yrs	6-10yrs	11-15yrs	16-20yrs	>20yrs	p-value
N (%)	34(18%)	76(40%)	44(23%)	22(11%)	10(5%)	4(2%)	
Male (%)	18(53%)	28(37%)	12(27%)	8(36%)	6(60%)	2(50%)	
Age (yrs)	50.8	52.3	62.0	60.8	66.8	63	
WC (cm)	100.1	95.5	100.3	102.6	97.5	90.0	0.43
SBP (mmHg)	124.4	130.5	133.0	141.6	145.0	160.0	0.07
DBP (mmHg)	81.8	83.2	78.4	83.4	79.0	85.0	0.73
LVM (g)	272.1	230.9	255.2	282.6	392.8	219.0	0.01*
CIMT (mm)	0.7565	0.7558	0.8545	0.8291	0.8180	0.8550	0.10
UA(mmol/dl)	333.3	342.1	382.0	419.6	417.7	490.0	0.03*
Chol T(mmol/dl)	4.46	4.79	4.94	5.67	4.65	6.70	0.14
HDL(mmol/dl)	1.18	1.17	1.30	1.25	1.23	1.0	0.87
TG (mmol/dl)	1.41	1.46	0.92	1.26	1.71	1.80	0.36
FBS (mmol/dl)	9.9	9.6	10.5	9.1	9.4	8.6	0.70
Cr (mmol/dl)	91.76	87.79	96.00	99.65	91.0	257.20	0.00*

Keys; WC- waist circumference, SBP- systolic blood pressure, DBP- diastolic blood pressure, LVM- left ventricular mass CIMT- carotid intima-media thickness, UA uric acid, chol T- total cholesterol, HDL- high dense lipoprotein, FBS- fasting blood sugar, Cr- createnin. P-value was significant (*)

DISCUSSIONS

We sought to determine cardiovascular risk among diabetic patients presenting for their first specialist visit. It was observed that 41% of patients had been diagnosed with DM more than 5years prior to first specialist visit. This finding may appear disturbing considering the fact that most diabetes mellitus patients have been reported to have complications as at the time of diagnosis.[7,8] Specialist evaluation may be urgently needed to evaluate some of these complications. It therefore means interventions could be delayed with grave consequences. This may not necessarily be entirely true because some subjects may have been accessing health care at primary and secondary health care levels with satisfaction. It is logical that patients with long duration of DM were significantly older than the younger group. Hypertension was seen to be associated with DM in 51% of all cases and in more than 50% in both groups. We however did not ascertain if hypertension preceded DM or the other way round. The use of

diuretics was noted in 25% of subjects for blood pressure control. The thiazide diuretics and beta blockers have been known to affect carbohydrate metabolism subjecting patient to DM.[10]

In order to demonstrate increasing pattern, we needed to compare groups of individuals at different stages of the disease. Considering the skewed pattern of distribution of subjects, the median value 5 years duration of DM was taken as dividing point to get two groups for comparism. It was obvious these asymptomatic people having to live longer with DM have more severe cardiovascular risk. When we looked further at the echocardiographic findings between these two groups, the observation was similar. Studies like that of Osunkwo[13] had demonstrated that microangiopathy (CVD risk) is strongly associated with duration of DM, a finding consistent with ours. Danbauchi et al[12,14] also demonstrated left ventricular abnormality in DM patients. To further demonstrate the pattern with which each of this cardiovascular risk increases, in other words the rapidity with which these factors increase. A further sub-grouping of duration of DM was compared with the similar group of cardiovascular risks. The rapidity with which these risk factors increase varies. Statistically however, there were differences in the means of CVD risk in the two groupings using the student t-test and differences in means of LVM, UA and creatinine. Objectively, looking at the values of level of significance (p-value) it appears the degree of increasing risk varies with the type of cardiovascular risk. These could suggest rapid renal and cardiac complication in symptomatic DM subjects.

Limitations: The therapy these subjects had before presenting to the specialist clinic could have altered our findings and a prospective study will be ideal for this kind of study. The proportions of subjects in the different groupings varied greatly making comparisms less ideal.

Conclusion: Most cardiovascular risks steadily rise as the duration of DM gets longer and findings suggested a higher prevalence of heart and renal complications as DM progresses in this environment.

References

1. Knut Borch-Johnsen Editorial; Diabetes and cardiovascular disease: the challenges of prevention, diagnosis and treatment Steno Diabetes Centre, Gentofte, Denmark 2008; 20: 151-152
2. Nathan DM, Meigs J, Singer DE. The epidemiology of cardiovascular disease in type II Diabetes Mellitus: how sweet it is…or is it? Lancet 1997; 350:14-19
3. Ryden L . Guidelines on diabetes, prediabetes, and cardiovascular disease. European heart journal. accessed from http;//www.escardio.org/guidelines
4. Lloyd-Jones P, Leip EP, Larson MG, et al. Prediction of lifetime risk for cardiovascular disease by risk factor burden at 50 years of age. Circulation 2006; 113:791-798.
5. Tung P, Levin SR. Nephropathy in NIDDM. American Journal of Medical Sciences 1988; 85: 131
6. Remuzzi G, Schieppati A, Ruggenenti P. Clinical practice. Nephropathy in patients with type 2 diabetes. N Engl J Med 2002; 346:1145-1151.
7. Eckel RH, Wassef M, Chait A. Prevention Conference VI: Diabetes and Cardiovascular Disease: Writing Group II: Pathogenesis of atherosclerosis in diabetes. Circulation 2002; 105:e138.
8. Expert Committee on the Diagnosis and Classification of Diabetes Mellitus: Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 1997 20:1183–1197.
9. Feller S. Waist circumference gives a better prediction of diabetes risk than does BMI. Deutsches Ärzteblatt International . ScienceDaily (July 15, 2010)
10. Lorenz MW, Markus HS, Bots ML, Rosvall M, Sitzer M. Prediction of clinical cardiovascular events with carotid intima-media thickness: A systematic review and meta-analysis. Circulation 2007; 115:459-467.
11. Kitamura A, Iso H, Imano H, et al. Carotid intima-media thickness and plaque characteristics as a risk factor for stroke in Japanese elderly men. Stroke 2004; 35:2788-2794.
12. Oyati A I, Danbauchi S S, Alhassan M A, Isa MA. Normal values of echocardiographic parameters of apparently healthy adult Nigerians in zaria. Afr. J. Med. Sci. 2005;34; 45-49
13. Osunkwo D A, Okeahialam B N. Left ventricular function in Nigerian Africans with non-insulin dependent diabetes mellitus. Am J Cardiol Apr 2001; 87;1026-1029
14. Danbauchi SS, Anumah FE, Alhassan MA,

David SO, Onyemelukwe GC, and Oyati IA, Left ventricular function in type 2 diabetes patients without cardiac symptoms in Zaria, Nigeria. Ethnicity & Disease 2005 15(4):635-640